

Water vapor, temperature, and ice particles in polar mesosphere as measured by SABER/TIMED and OSIRIS/Odin instruments

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Although many new details on the properties of mesospheric ice particles that form Polar Mesospheric Clouds (PMCs) and also cause polar mesospheric summer echoes have been recently revealed, certain aspects of mesospheric ice microphysics and dynamics still remain open. The detailed relation between PMC parameters and properties of their environment, as well as interseasonal and interhemispheric differences and trends in PMC properties that are possibly related to global change, are among those open questions.

In this work, mesospheric temperature and water vapor concentration measured by the Sounding of the Atmosphere using Broadband Emission Radiometry (SABER) instrument on board the Thermosphere Ionosphere Mesosphere Energetics and Dynamics (TIMED) satellite are used to study the properties of PMCs with respect to the surrounding atmosphere. The cloud parameters, namely location, brightness, and altitude, are obtained from the observations made by the Optical Spectrograph and Infrared Imager System (OSIRIS) on the Odin satellite.

About a thousand of simultaneous common volume measurements made by SABER and OSIRIS in both hemispheres from 2002 until 2008 are used. The correlation between PMC brightness (and occurrence rate) and temperatures at PMC altitudes and at the mesopause is analysed. The relation between PMC parameters, frost point temperature, and gaseous water vapor content in and below the cloud is also discussed. Interseasonal and interhemispheric differences and trends in the above parameters, as well as in PMC peak altitudes and mesopause altitudes are evaluated.